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THE RECENT TRANS-AFRICAN FLIGHT AND ITS LESSON

By LIEUTENANT LEO WALMSLEY, M.C., late R.A.F.

When, at the end of 1918, the termination of the war with Turkey released the energies of the British Royal Air Force in the Middle East for other tasks, Major-General W. G. H. Salmond, the commanding officer, decided upon the examination and equipment of several long-distance air routes as a means of promoting peace-time aviation. One of these routes, over which he personally made a flight in December, 1918, was from Egypt to India by way of Palestine, Bagdad, the Persian Gulf, and the coast of Baluchistan. Another was a continuation of this route from India to Australia. Even before it was completely examined this route was traversed by way of the Malay Peninsula and the East Indies in November and December, 1919, by Captain Ross Smith of the Australian Flying Corps in his successful flight from England to Australia.[1] The third route was from Cairo to Cape Town (cf. map, Fig. 1).

THE RECENT CAIRO-CAPE TOWN FLIGHT

The opening of this route to airplane traffic was announced by the British Air Ministry late in December, 1919.[2] Within two months four airplanes started on the flight. Two of these did not get beyond the first stage of the journey, one being forced to come down between Aswan and Wady Halfa on the middle Nile, the other crashing to earth near Shereik station below the mouth of the Atbara. The third, a machine flying under the auspices of the *London Times* and piloted by Captain S. Cockerell and Captain F. C. Broome, was the first to depart. It left Cairo on February 6.

[1] For a discussion of the meteorological conditions on this route see Griffith Taylor: Air Routes to Australia, *Geogr. Rev.*, Vol. 7, 1919, pp. 256-261.—EDIT. NOTE.

[2] For an account of the laying out of the Cairo-Cape Town air route see: Cape to Cairo by Air: How the Route Was Prepared Over Bush and Jungle, *African World*, Jan. 3, 1920, p. 389, and W. T. Blake: From Cairo to Cape Town: Working on the African Air Route, *ibid.*, pp. 390-391. The course of the flights can be followed in the weekly issues of the *African World* from February 7 (with map in supplement) to March 27 and of the *London Times: Weekly Edition* from February 6 (map in illustrated section) to March 26.—EDIT. NOTE.

Proceeding in gradual stages, which were marked by a series of forced landings because of engine trouble, it reached Khartum on February 7, Mongalla on the White Nile on February 14, Jinja on the northern shore of Victoria Nyanza on February 22, finally meeting its fate, fortunately with no fatality to its occupants, at Tabora, Tanganyika Territory (formerly German East Africa), on February 27. The fourth airplane, the *Silver Queen,* piloted by Lieutenant-Colonel P. van Ryneveld and Lieutenant C. J. Quintin Brand, two South African officers of the Royal Air Force, left Cairo on February 10 and came to grief the next day at Korosko between Aswan and Wady Halfa. Using a second machine, the *Silver Queen II,* placed at his disposal by the South African Government, Colonel van Ryneveld started anew from Cairo on February 22. Khartum was reached on February 23, Mongalla on February 25, Kisumu on the northeastern shore of Victoria Nyanza on February 26, Abercorn at the southern end of Lake Tanganyika on February 28, Livingstone on March 2, and Bulawayo on March 5. Shortly after leaving Bulawayo the next day the airplane was wrecked. The aviators remained here pending the arrival of a new machine sent from Cape Town and on this, the *Voortrekker* (Pioneer), left Bulawayo on March 17, reaching Pretoria on the same day and Cape Town on March 20, thus successfully completing the flight.

Distances and Flying Time

The actual flying time between Cairo and Cape Town, a distance of 5,206 miles by the air route, had been 72 hours and 40 minutes, and the average speed therefore about 72 miles an hour. Colonel van Ryneveld's flight had really begun on February 4 from the Brooklands aerodrome near London, whence he reached Cairo on February 9 by way of Turin, Rome, Apulia, the Ionian Islands, and Derna. The total distance from London to Cape Town, traversed in three airplanes, was about 7,600 miles, covered in 4 days, 13 hours, and 30 minutes of actual flying time. The flight of the *Times* machine had likewise begun at Brooklands, on January 24, Cairo being reached on February 3 by way of Lyons, the mouth of the Rhone, Rome, Malta, Tripoli, and Benghazi. The total distance between London and Tabora by this route was 5,378 miles, 2,628 of which represented the distance between Cairo and Tabora, covered in 36½ hours of actual flying time.

Difficulties of the Trip

These events have clearly demonstrated that trans-African airplane flight is a far more difficult undertaking than it was first considered to be. The series of mishaps that overtook all of the aspirants—even the successful—for the honor of being the first to fly from Cairo to Cape Town seems to prove that from the commercial point of view a regular transcontinental airplane service under present conditions is impracticable.

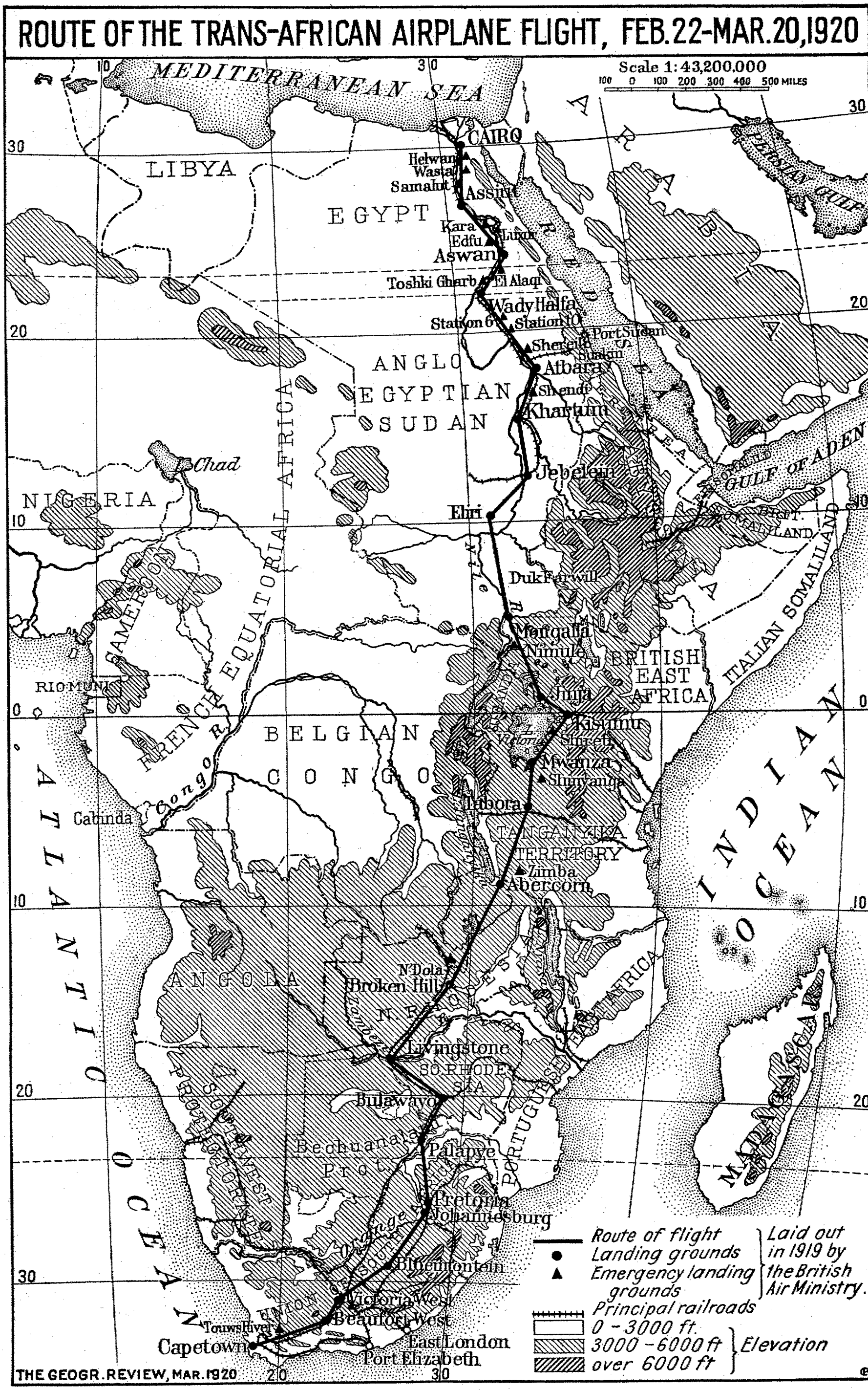
ROUTE OF THE TRANS-AFRICAN AIRPLANE FLIGHT, FEB.22-MAR.20,1920
Scale 1:43,200,000
100 0 100 200 300 400 500 MILES
MEDITERRANEAN SEA
CAIRO
Helwan
Wasta
Samalut
Assiut
LIBYA
EGYPT
Kara
Edfu
Luxor
Aswan
Toshki Gharb
El Alaqi
Wady Halfa
Station 6
Station 10
Port Sudan
Suakin
Shereik
Atbara
Shendi
Khartum
ANGLO EGYPTIAN SUDAN
FRENCH EQUATORIAL AFRICA
Chad
NIGERIA
Jebelein
Eliri
Duk Fariwill
Mongalla
Nimule
Jinja
Kisumu
BRITISH EAST AFRICA
ITALIAN SOMALILAND
BRIT. SOMALILAND
GULF OF ADEN
PERSIAN GULF
ARABIA
CAMEROON
RIO MUNI
Congo R.
BELGIAN CONGO
Cabinda
Mwanza
Shinyanga
Tabora
TANGANYIKA TERRITORY
Zimba
Abercorn
INDIAN OCEAN
ATLANTIC OCEAN
ANGOLA
N'Dola
Broken Hill
Zambezi
Livingstone
SO. RHODESIA
Bulawayo
Bechuanaland Prot.
Palapye
PORTUGUESE EAST AFRICA
MADAGASCAR
Pretoria
Johannesburg
Bloemfontein
Victoria West
Beaufort West
Touws River
Capetown
East London
Port Elizabeth
Route of flight
Landing grounds
Emergency landing grounds
Laid out in 1919 by the British Air Ministry.
Principal railroads
0 - 3000 ft.
3000 - 6000 ft
over 6000 ft
Elevation
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FIG. 1

On the newspaper map it looks very simple—a straight line between Cairo and Khartum, Khartum and Mongalla, and so on down to Cape

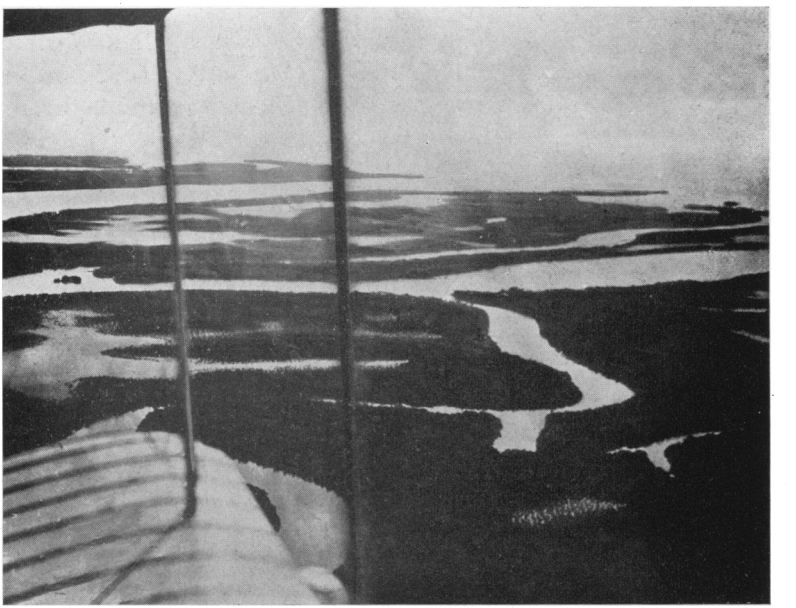

FIG. 2—Mouth of the Rufiji River, East Africa, from an airplane.

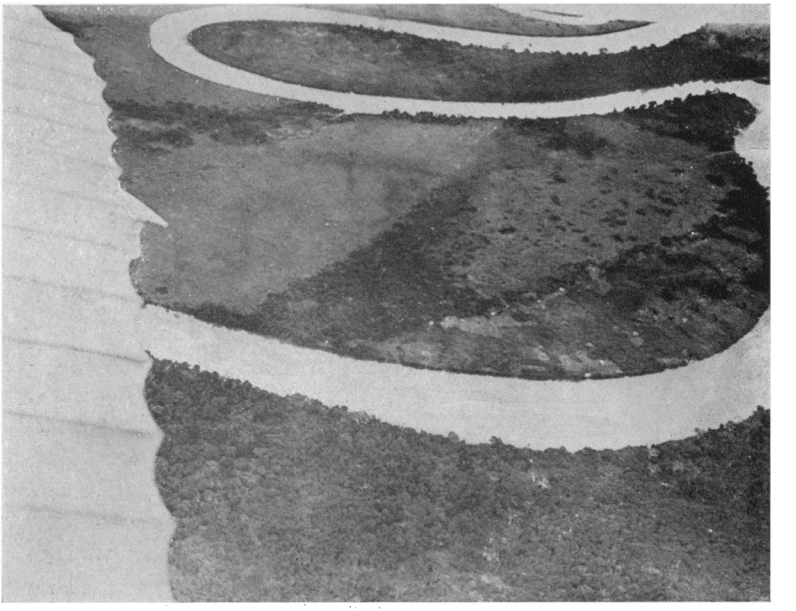

FIG. 3—Meanders of an East African river. (Part of airplane wing on left).

Town. But unfortunately these maps, so freely circulated of late, supply but the scantiest information regarding the geographical and other condi-

tions that are of real importance to airmen. Few maps show that two-thirds of the route chosen by the Air Ministry runs across country 3,000

FIG. 4—Mangroves fringing the shore.

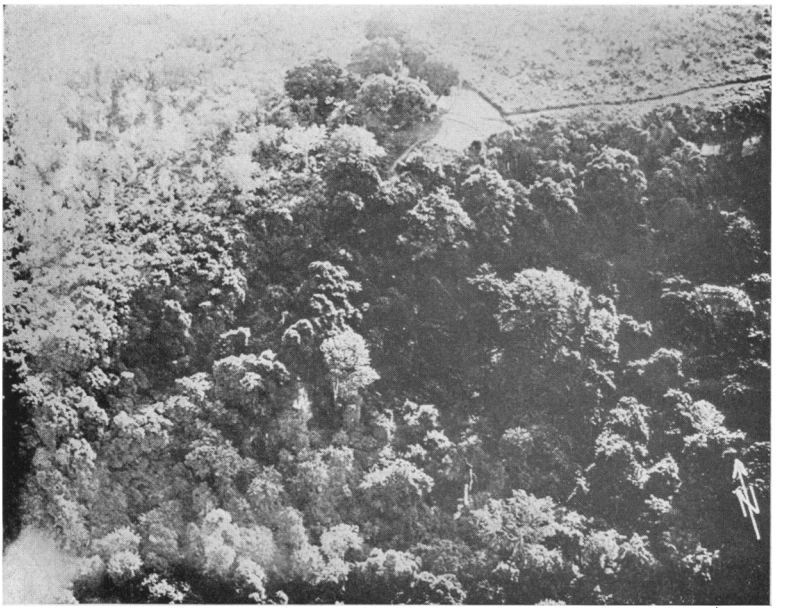

FIG. 5—The real tropical forest. Note the clearing in center background.

to 6,000 feet above sea level; that the country is clad for the greater portion in dense bush and forest; that temperature conditions range from

extremes of intense damp heat to cold as severe as in northern Europe. They tell one nothing of the fierce winds that howl over the tropical highlands at certain times of the year, of the thunderstorms and rains that will transform the sun-baked veld into a lake in fifteen minutes; of the dense cloud banks that envelop mountain ranges for months at a time; of the mists that hang over valleys and swamps and render the landing of an airplane an operation fraught with the greatest danger.

The general trend and details of the great chain of aerodromes constructed by the Air Ministry across Africa may be gathered from the accompanying map. For the purpose of this article I shall divide the route into three great sections; first, the Egyptian, from Cairo to Khartum (1,040 miles); second, the central, from Khartum to Livingstone (2,600 miles); and third, the South African, from Livingstone to Cape Town (1,560 miles).

The preparation of these aerodromes has been a costly and difficult undertaking, particularly in the central and South African sections. In certain districts it was found necessary to hew down great patches of forest in order to make enough clear space, and even then the ground had to be cleared of termite heaps and leveled by hand before an airplane might land in safety. In the *sudd* country of the upper Nile, an area of 35,000 square miles, the difficulty was to find a suitable piece of dry ground. In the Egyptian section the work was not so difficult, as the flat valley of the Nile naturally afforded hundreds of suitable sites.

But, if aerodromes were the only problem, any airplane capable of flying 350 miles might make the flight. The aerodromes are, as a matter of fact, as good, and probably better than those found in England, and they are certainly superior in size, surface, and approach to the best that we had during the East African campaign. In those days we considered a rectangle measuring 200 by 600 yards a veritable Salisbury Plain.

Air Conditions

On the face of things, the Egyptian section should not present any special difficulties to an up-to-date high-powered airplane, provided that reasonable precautions in regard to loading are taken and that during the heat of the day the machine is kept at a good altitude. Under 2,000 feet heat gusts may be expected, and they are sufficient to impose a great strain, not only on the structure of the machine but also on the physical powers of the pilots. From what one can gather, the Handley-Page that crashed at Shereik was almost shaken to pieces by these atmospheric disturbances, and the crew were indeed fortunate to escape with their lives.

These heat gusts, bumps, or air pockets, as they are variously termed, naturally grow worse in the vicinity of the equator, and in the central section they become a very serious problem indeed. The heat gusts usually take the form of vertical currents or columns which rise to a height vary-

ing from 100 to 2,000 and even 3,000 feet. Frequently these columns rotate, and they rise with such force as to suck up clouds of dust, sand, leaves, and other vegetable débris. On a hot day it is quite common to see a score of these "dust devils" within an area of a few square miles, and their effect on an airplane may be imagined. It was quite a usual experience while flying in Central Africa to be shot up suddenly a thousand feet or more without a second's warning, for it does not always follow that the currents are visible. When they occur over rocks or hard, sun-baked country naturally they contain no dust.

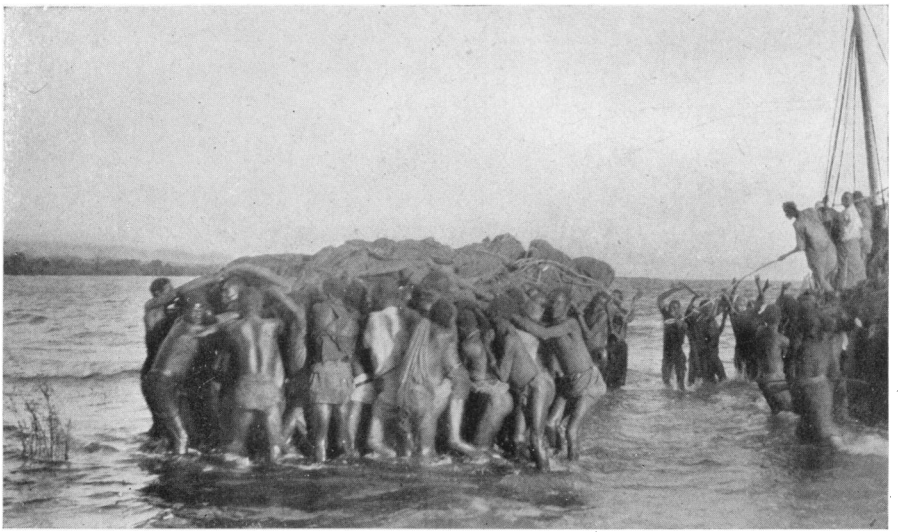

FIG. 6—Landing an airplane hangar on Lake Nyasa.

Compensating the upward currents of warm air, columns of cold air fall with corresponding force; and these, which are always invisible, are apt to be more dangerous. If an airplane about to land encounters a big "pocket," there is every chance of its dropping straight to the ground. The writer saw three machines wrecked in this way on the East African coast.

The only sure way to avoid air gusts is to fly either at night, early morning, or late afternoon, or to maintain an altitude of at least 8,000 feet throughout the hottest hours of the day. Even at this height near mountains or in the shadow of clouds air gusts may still be expected.

It is no exaggeration to say that flying an airplane at a low altitude during the heat of the day in Central Africa is harder work than holding the helm of a fishing yawl in a heavy northeaster.

EFFECT OF ALTITUDE

Added to this problem of gusts we find, in the central and South African sections, another problem—that of altitude. I have already referred

to the great tableland that occupies the whole of the center of Central and South Africa. On an average it lies between 3,000 and 6,000 feet above sea level, and the atmosphere is consequently very rarified and lacking in buoyancy. This, coupled with the "thinning" effect of the sun's heat, makes it extremely difficult to get an airplane into the air; and the strain on the engine is so great that it may give out just at the most critical moment—precisely what happened with the *Times* machine at Tabora. Colonel van Ryneveld, who flew 3,880 miles of the journey from Cairo before his machine crashed at Bulawayo, experienced great difficulty at Abercorn (5,650 feet), the highest landing ground on the route, where he had to discard everything not absolutely essential in order to be able to leave the ground.

The effect of altitude diminishes slightly towards the southern end of Africa; but, unless a new route either by way of the eastern or western coast be chosen or unless higher-powered and greater-winged surface craft be used, there is no avoiding it.

The Type of Engine To Be Used

An analysis of the log books of the persons who attempted the flight would show that the main causes of failure were engine troubles. I am not enough of an engineer to deal with this side of the problem; but I think it is worth noting that in two years' experience of flying in all quarters of Central Africa we found that the ordinary air-cooled engine was infinitely more reliable than those of the water-cooled type, and it possesses the inestimable advantage of lightness. The engines employed in all the machines entered for the Cape Town flight were water-cooled and were supposed to be absolutely the best so far as design and workmanship went. It must be remembered, however, that they were fitted to heavy machines carrying full loads and that the strain borne by them while flying through rarified and gusty air was tremendous.

Weather Difficulties

In addition to the ordinary atmospheric conditions, which in the central section do not vary, we have another serious problem in the weather. This in Africa is a better-known quantity than in England, for the rainy seasons and dry seasons occur with little irregularity. Unfortunately for the would-be traveler from Cairo to the Cape they do not occur at the same time throughout the route but at such periods of the year as to make it almost impossible for an airplane to have fine weather all the way. To fly across Central Africa in its rainy season is no easy matter, for never a day passes without a thunderstorm and a torrential downpour of rain sufficient, as I have already said, to turn the veld into a lake within a few minutes. In the air these storms may usually be dodged; but an airplane, unless it carries a sufficient margin of fuel, may be driven so far out of its

course as to make a forced landing necessary. A forced landing in this part of the world is full of possibilities, among which an undamaged machine is not the only one; for a landing ground, in the ordinary meaning of the word, does not exist. Practically the whole country lying between Mongalla and Livingstone consists of rolling veld or mountains clad almost without break in dense bush and forest. Even the most seductive grassy glades are pitted with termite heaps, and it is infinitely more dangerous to crash into one of these while making an otherwise good landing than to "pancake" deliberately into the bush when the branches and foliage,

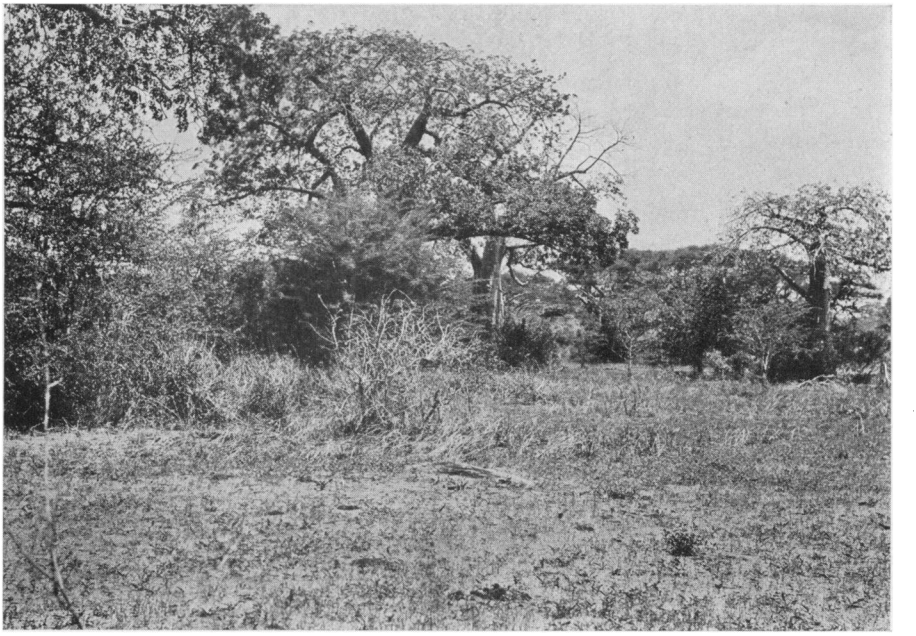

FIG. 7—Typical "bush" country with baobab trees.

though wrecking the machine, usually break the fall of the occupants. Granted that the airmen escape safely from the crash, they may find they have only jumped from the frying pan into the fire. The country they have landed in may be entirely waterless; it is probably infested with lions, buffaloes, and rhinos; and, unless they are armed, they may find the march to the nearest camp, aerodrome, or village as full of adventure as a Jules Verne romance.

UNSUITABILITY OF AIRPLANES TO COMMERCIAL TRAFFIC

In spite of all these natural obstacles with which Dark Africa guards the secrets of her heart, Colonel van Ryneveld's success shows that the through journey can be made. At the same time, I am convinced that for a regular trans-African service the airplane, even when worked in relays,

is not a practicable commercial undertaking. It has been clearly proved that the heavy type of airplane is not suitable for the tropics; and the lighter type would not have sufficient cargo space to make it pay. The cost of the various relay stations, the transport of fuel and spare parts, the upkeep of the aerodromes and emergency landing grounds would be enormous and out of all proportion to the profits received from express, mail, and passenger traffic. The risk of forced landings would never be entirely eliminated, and the average business man would, I think, prefer a week's

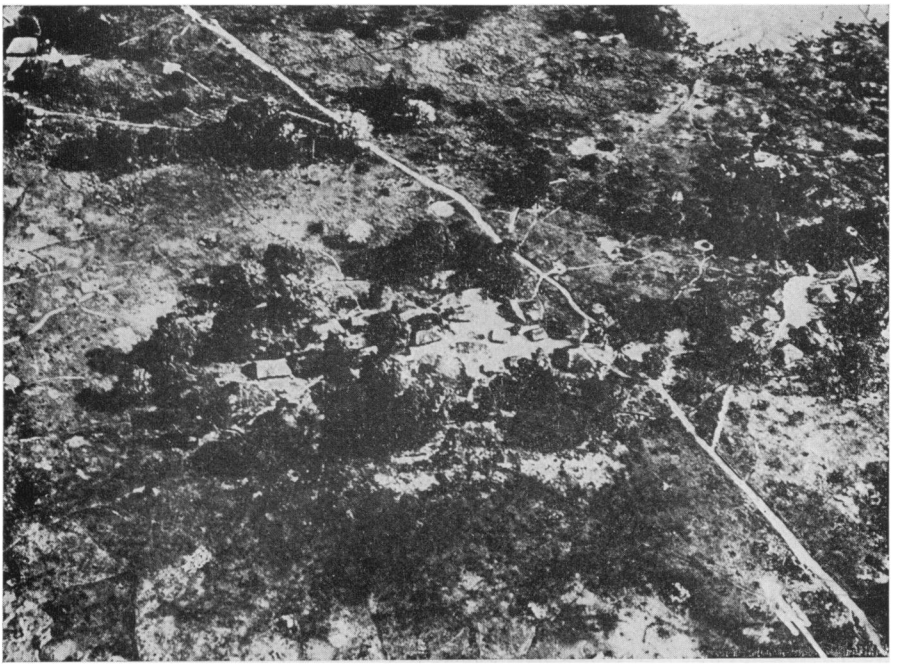

FIG. 8—A native village seen from the air.

delay in sending an urgent letter to the risk of losing it completely. The perfection of wireless telephony will rob the airplane of its advantage as a letter carrier.

SUITABILITY OF AIRSHIPS

With the airship things are different. Here we have a machine capable of carrying a useful load and of flying enormous distances without the necessity of landing. Because of its independent buoyancy and its numerous engines and their accessibility nothing short of a total collapse would bring it to earth without the will of its occupants. But the airship presents many problems of its own. The effect of the tropical sun on the envelope would probably be very great. The expansion of gas due to the changing temperatures would be a matter demanding much thought. If an airship could maintain a height of over 8,000 feet while flying over the

tropical zone, no trouble should be experienced from gusts. The actual temperature of the air at this height is practically the same all over the world; and, if some fabric absolutely impervious to the sun's heat rays could be evolved, there would be no trouble from expansion.

In the writer's opinion, the only regular air service across Africa would be one of giant airships. It will probably be organized in three stages: the first from Cairo to Khartum, the second from Khartum to Livingstone, and the third from Livingstone to Cape Town. Sheds would be required

FIG. 9—Dar-es-Salaam, Tanganyika Territory.

only at Khartum and at Livingstone, as a protection from the heat; at Cairo and Cape Town mooring masts would be sufficient. For the first and third stages any modern type of Zeppelin would do; but for the central zone a specially constructed high-powered, sun-resisting craft would be required, capable of climbing to 15,000 feet and maintaining this height throughout the journey to Livingstone. In East, Central, and South Africa this airship service might be linked up with airplanes, and mails might be carried to their destination in one-half the time taken at present.

THE WONDER OF THE AFRICAN AIRSCAPE

If ever a Cairo-to-Cape Town air service is inaugurated, there should be no dearth of sight-seeing passengers; for Africa as seen from the air is one of the most wonderful of all countries. The flight up the Nile

would alone be an experience to talk about until one's dying day; and there is hardly a square mile of country lying between the northern and southern extremities of Africa that has not its special interest. The central portion of the route lies over a land which even yet is a sealed book so far as the white man is concerned; over vast stretches of country where the only roads are those made by roving elephants or countless herds of antelope, zebra, and giraffe; over regions of scenery absolutely unrivaled in its loveliness. A civilized country seen from the air is simply a gigantic mosaic, monotonous in its regularity; but the airscape of Central Africa is as untamed and irregular as that of the moon. Except in the rainy season fogs or mists are unknown, and only the curving of the earth limits the range of visibility. The view over the rolling sunlit veld, with its rounded kopjes and winding silver rivers, its mysterious marshy lakes, and its stupendous snow-capped mountains, is something never to be forgotten. Probably many of these scenes will be filmed, and the public may see them as it has seen the wonders of the Antarctic and the South Sea Islands—in the easy comfort of a plush-backed chair. Yet no camera or artist can ever faithfully portray the magic wonders of the African air. Only to those who are bold enough or, what is perhaps more important, rich enough to go and see for themselves will they be revealed.